

objectives in ¶78 of the NPRM of awarding authorizations “to the parties that value them most highly.” Furthermore, since the winning bidders would not be realizing the full values of the channels, the expected revenues from the sale of the licenses would likely be lower. These considerations would strongly favor offering the 28 channels in a single package.

Further support for this proposition is provided by Robert Wilson's (1979) classic paper on share auctions, which compares the outcome when bidders are allowed to bid for fractions of a divisible object (“share auctions”) as opposed to when they are forced to bid for the entire quantity (“unit auctions”). Even when bidders do not experience aggregation gains from possessing a larger share of the object, Wilson (1979, p. 688) writes: “I conclude from this study of examples of share auctions that, compared to unit auctions, the seller may experience a considerable reduction in revenue. The loss in revenue stems from two features: as in Example 1 it may be that the seller obtains no advantages from increased competition as the number of bidders increases, or as in Example 2 the multiplicity of optimal strategies enables the bidders to choose an optimal strategy that is severely disadvantageous to the seller.”

Finally, packaging the 28 channels together yields a much simpler auction for participants. This simplicity serves one of the FCC's stated objectives in ¶78 of the NPRM to “(3) avoid bidding procedures that are overly complex and costly in relation to the task to be accomplished.”⁵

⁵Ausubel and Cramton (1995) have recently established that uniform-price share auctions inevitably result in inefficient allocations.

b. ADVISABILITY OF SEQUENTIALLY AUCTIONING 110° FOLLOWED BY 148°.

In ¶80 and ¶84 of the NPRM, the Commission solicits comment on its tentative decision to auction the two licenses sequentially (as opposed to simultaneously), with the 110° license preceding the 148° license. The tentative plan is both sensible and advisable.

Any discussion of sequentiality versus simultaneity should begin with the observation that essentially the entire justification for using a simultaneous auction is that there may be synergies between the licenses being offered. However, in the particular instance of the 110° and 148° licenses, ¶80 of the NPRM correctly states: "there is no evidence of synergies between the channels at the two orbital locations." Meanwhile, a simultaneous auction has at least three drawbacks, which should discourage its use when synergies are absent: a simultaneous auction requires more complicated bidder strategies; yields a tendency toward lower seller revenues; and may facilitate both predatory bidding and tacit collusion.

Auctioning the licenses sequentially will result in a shorter and simpler auction. The brevity serves one of the FCC's stated objectives in ¶78 of the NPRM to "(2) award licenses to the appropriate parties rapidly, so that consumers will benefit from the competition brought about by new suppliers as soon as possible." The simplicity serves another of the FCC's stated objectives in ¶78 of the NPRM to "(3) avoid bidding procedures that are overly complex and costly in relation to the task to be accomplished."

As stated above in Section 3a, uniform-price share auctions create a tendency for objects to be awarded at artificially low auction prices (Wilson, 1979). Since simultaneous auctions share many of the characteristics of share auctions, the FCC should be concerned that a simultaneous auction might lead to lower revenues than a sequential auction. Simultaneous auctions probably also exacerbate the potential for predatory bidding and tacit collusion, because of their defining rule that

the bidding does not end on any license until it ends on every license. Until the bidding closes for any particular license, the possibility of raising the price on that license remains, either as a means to prey upon the bidder or to punish the bidder for its bidding on other licenses.

Finally, it should be emphasized that the empirical experience in the FCC's simultaneous auctions for narrowband and broadband licenses has been that the higher-valued licenses systematically converge to their terminal values sooner than do the lower-valued licenses. (Cramton 1995a, 1995b.) This suggests that the following general principle be adopted: In circumstances where the FCC chooses to utilize sequential auctions, the FCC should sequence the licenses in descending order of value, so as to mimic what would be expected in the simultaneous auction and so as to achieve a similar outcome as would be expected under that format.

In the case of the current DBS licenses under discussion, this metaprinciple would clearly advise that the 110° license be auctioned first, and the 148° license second.

c. ADVISABILITY OF MULTIPLE-ROUND BIDDING.

In ¶81 of the NPRM, the Commission requests "comment on the various advantages and disadvantages of single round and multiple round bidding as a method of auctioning DBS permits in the future." Auction theory argues in favor of multiple-round bidding.

William Vickrey (1961) and later auction theorists have established that there are decisive advantages to second-price sealed-bid auctions over first-price sealed-bid auctions, in terms of both simplicity for bidders and efficiency of outcomes. This would enhance the FCC's stated objectives in ¶78 of the NPRM of awarding authorizations "to the parties that value them most highly" and to "(3) avoid bidding procedures that are overly complex and costly in relation to the task to be accomplished." Unfortunately, the FCC is presumably limited by political constraints to conduct only

first-price sealed-bid auctions, as opposed to second-price sealed-bid auctions (see for example, Rothkopf, Teisberg and Kahn, 1990, and McMillan, 1994). Given that the open-outcry English auction is strategically similar in nature to the second-price sealed-bid auction *and is politically feasible*, use of it is strongly recommended.

As correctly elaborated in ¶81 of the NPRM, an open-outcry English auction also offers advantages over the sealed-bid second-price auction (even if the latter were politically feasible): the English auction “may result in more aggressive bidding because it may provide more information about the value of the permit. With better information, bidders have less incentive to shade their bids downward in order to avoid the 'winner's curse'.” (See Milgrom and Weber, 1982.) Thus, in the case of affiliation, the English auction can be expected to produce greater seller revenues than a second-price sealed-bid auction.

The risk of collusion in an open-outcry auction for the current DBS licenses appears minimal, due to the fact that only a single object is being offered at a time, and only two in total. Collusion should only be a major concern if the bidders have the opportunity to divide up the items being offered. In this case of the DBS auction, only one bidder will get to win the prize of the 110° channels, so it is hard to imagine what sort of collusive agreement could be reached within the auction itself.

d. INADVISABILITY OF A COMBINED SEALED-BID/ORAL-OUTCRY AUCTION.

In ¶83 of the NPRM, the Commission solicits “comment on whether a combined sealed bid-oral outcry auction may be appropriate.” Any shift from a pure-open-outcry auction to a combined sealed-bid/oral-outcry auction would be inadvisable and contrary to the tenets of auction theory.

The leading results on this issue can be derived from Christopher Avery's doctoral dissertation, the research from which appears in Avery (1994). Avery's research generally focuses on the phenomenon of jump bidding (see Section 2d, above), but his formal analysis literally solves the two-stage game where: in the first stage, bidders simultaneously submit opening bids; and in the second stage, the play continues as in an "open-exit auction" (Avery, 1994, p. 9). Since an open-exit auction is simply a mathematical representation of an oral-outcry auction, Avery's model captures the essential features of a combined sealed-bid/oral-outcry auction, and his results ought to be taken as decisively rejecting the combined auction.

Avery's main results are the following theorem:

THEOREM 6.1. Suppose that the bidders choose their opening bids endogenously and simultaneously from a fixed set of n possible bids and that they continue according to a prespecified asymmetric equilibrium favoring the higher bidder. Then there is a unique symmetric signalling equilibrium, with strategies identical to those strategies for an n -stage descending signalling game with the same set of possible jump bids.

accompanied by:

PROPOSITION 5.7. Equilibria of multistage games with descending signals cover the range of expected prices between that of the first-price auction and the symmetric equilibrium of the second-price auction.

Together, this theorem and proposition may be interpreted as a folk theorem for the combined sealed-bid/oral-outcry auction. The combined auction admits a continuum of equilibria with expected prices everywhere between those from first-price and second-price rules.

Let us couple Avery's results with the following restatement of a result from Milgrom and Weber (1982):

THEOREM 15. For the case of strict (weak) affiliation, the expected selling price in the second-price auction is strictly (weakly) greater than in the first-price auction.

We easily reach the conclusion that a combined sealed-bid/oral-outcry auction is inadvisable. The pure-open-outcry design proposed in Section I comes close to achieving the higher revenues inherent in a second-price auction. A combined sealed-bid/oral-outcry auction may yield the lower revenues from the first-price auction, and will not do better than a pure-open-outcry auction.

The intuition for the above results is that — as the FCC correctly notes in ¶81 of the NPRM — the open-outcry auction “may result in more aggressive bidding because it may provide more information about the value of the permit. With better information, bidders have less incentive to shade their bids downward in order to avoid the ‘winner’s curse’.” (Again, see Milgrom and Weber, 1982.) By the same token, a combined sealed-bid/oral-outcry auction can correctly be visualized as a mixture of a pure-open-outcry auction (i.e., second-price auction) and a pure-sealed-bid auction (i.e., first-price auction). Just as a pure-open-outcry auction poses less of a winner’s curse problem than a pure-sealed-bid auction, it also poses less of winner’s curse problem than any mixture of the two. A pure-open-outcry auction makes more information available to bidders than a combined sealed-bid/oral-outcry auction, so it encourages more aggressive bidding and higher expected seller revenues.

It also deserves emphasis that, in a pure-open-outcry auction for a single object, bidders merely need to bid up to what the object is worth to them. This simplicity serves one of the FCC’s stated objectives in ¶78 of the NPRM to “(3) avoid bidding procedures that are overly complex and costly in relation to the task to be accomplished.” By contrast, a combined sealed-bid/oral-outcry auction is a difficult environment for bidders to determine an optimal strategy. As in a conventional first-price auction, bidders can no longer simply bid what the license is worth, and instead are

obliged to shade their bids. Equilibria of the combined auction are difficult to solve for, and Avery (1994) showed that a continuum of equilibria may exist. On simplicity grounds, a pure-open-outcry auction is far preferable.

Because of the element of a first-price auction introduced by a combined sealed-bid/oral-outcry auction, it introduces the nontrivial possibility that the highest valuer of the license is eliminated before the oral outcry begins (in asymmetric equilibria, or when bidders' valuations are asymmetrically drawn from different distribution functions). This would be detrimental to both the objectives of allocative efficiency and of raising revenues in the auction.

Finally, it appears that the only reason why the NPRM floats the idea of a combined sealed-bid/oral-outcry auction is the suggestion in ¶83 that the combined auction “may help reduce the risk of collusion.” It should be emphasized that auction houses such as Sotheby's and Christie's face much more serious concerns about collusion when they auction high-priced works of art, yet we seldom observe them utilizing the device of a combined sealed-bid/open-outcry auction. The reasoning of Avery (1994), and the other arguments of this section, help to explain the lack of usage of such an auction format in the art world, and would advise the Commission to similarly maintain a pure-open-outcry format.

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A Structured Open-Outcry Auction

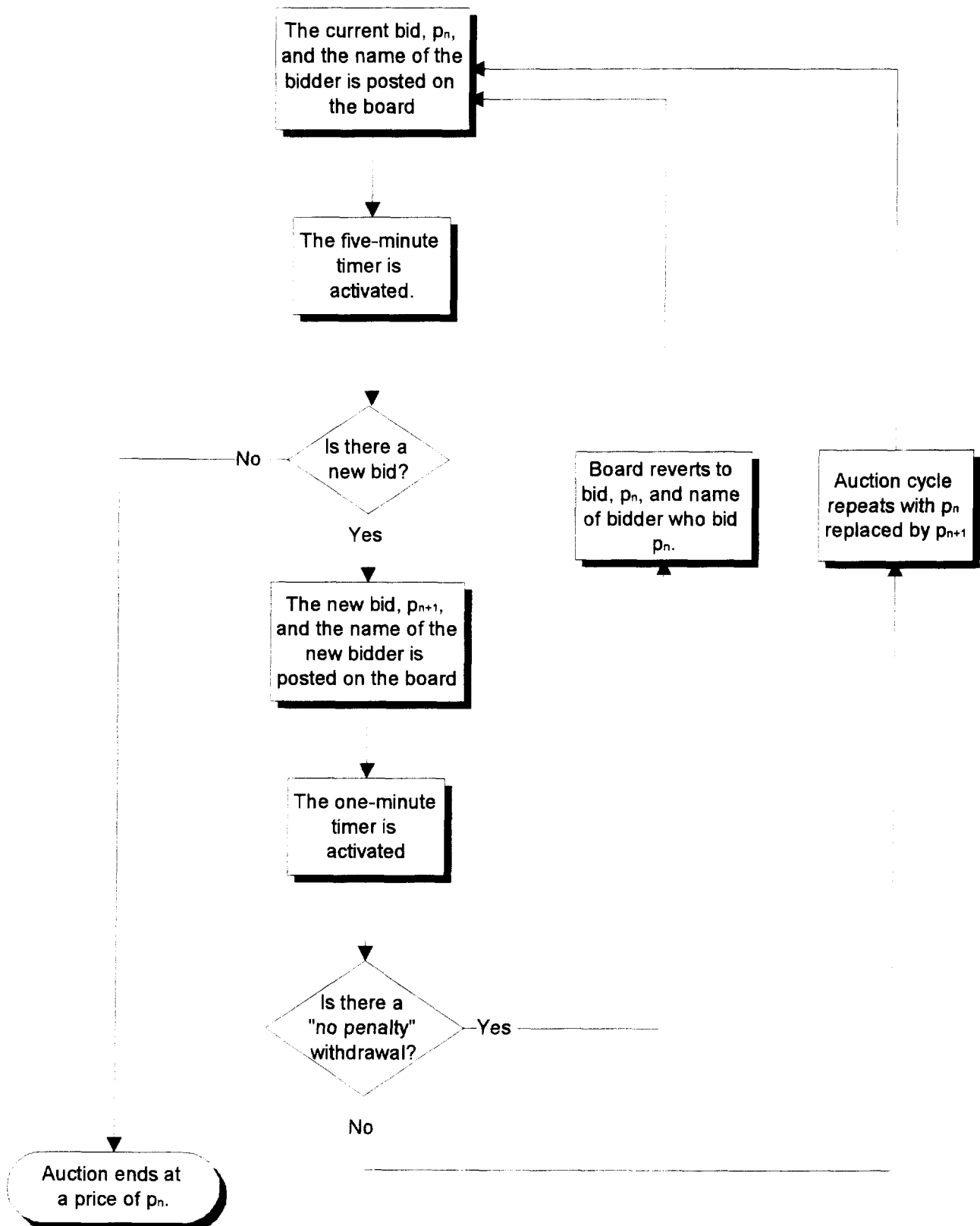


Figure 1

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- "The Credit Card Market, Revisited," mimeo, University of Maryland, July 1995.
- "Sequential Recontracting Under Incomplete Information" (with A. Sen), mimeo, University of Maryland, June 1995.
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"Sequential Recontracting and the Principal-Agent Problem" (joint with A. Sen).

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- "Asymmetric Price Adjustment," University of Texas Conference on Game Theory and Industrial Organization, Austin, May 1992.
- "Separation and Delay in Bargaining," North American Summer Meeting of the Econometric Society, Seattle, June 1992.
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- "The Credit Card Market, Revisited," Meetings of the Industrial Organization Society, Boston, January 1994.

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